

In the Claims

1 (previously presented). A tuner for digital television signals within very-high-frequency or ultra-high-frequency bands prescribed for terrestrial television broadcast transmitters, said tuner designed to generate intermediate-frequency signals responsive to selected ones of radio-frequency signals transmitted over the air from terrestrial television broadcast transmitters and received by an antenna nearby said tuner, said tuner further equipped for driving a first end of a transmission line several meters long with said intermediate-frequency signals to be supplied from a second end of said transmission line to further digital television signal reception apparatus that recovers baseband digital television signals, said tuner separately packaged from said further digital television signal reception apparatus and an apparatus for supplying remote control information, said tuner comprising:

electrically controlled front-end circuitry having an input port equipped for connection to said antenna to receive said radio-frequency signals therefrom and having an output port;

first electrically controlled frequency-conversion circuitry included within said electrically controlled front-end circuitry for supplying a first intermediate-frequency signal with prescribed first carrier frequency as a frequency-conversion response to the one of the radio-frequency signals within said very-high-frequency or ultra-high-frequency bands that is selected for reception by said electrically controlled front-end circuitry, that said one of the radio-frequency signals being selected for reception responsive to said remote control information supplied from said apparatus for supplying remote control information;

an intermediate-frequency voltage amplifier included in said electrically controlled front-end circuitry and connected for supplying said output port of said electrically controlled front-end circuitry with an amplified response to said first intermediate-frequency signal, which amplified response is principally to the single selected one of said digital television signals; and

a cable-driver amplifier having an input port connected to receive said frequency-selective amplified response to said first intermediate-frequency signal from the output port of said first electrically controlled front-end and having an output port equipped for supplying a further amplified response to said first intermediate-frequency signal to said transmission line and thence to said further digital television signal reception apparatus via said transmission line, rather than said intermediate-frequency signals being directly supplied from said intermediate-frequency voltage amplifier to said further digital television signal reception apparatus.

2(previously presented). A combination in which the tuner of claim 1 is connected by said transmission line to a digital television signal receiver that comprises:

demodulation and analog-to-digital conversion circuitry connected for responding to said first intermediate-frequency signal to generate a baseband digital television signal.

3(previously presented). A combination in which the tuner of claim 1 is connected by said transmission line to

frequency-conversion apparatus for converting said further amplified response to said first intermediate-frequency signal upward in frequency to generate a radio-frequency signal in a frequency range that can be detected by a broadcast digital television receiver.

4(previously presented). A tuner for digital television signals within very-high-frequency or ultra-high-frequency bands prescribed for terrestrial television broadcast transmitters, said tuner designed for driving a first end of a transmission line several meters long with intermediate-frequency signals responsive to selected ones of radio-frequency signals transmitted over the air from terrestrial television broadcast transmitters and received by an antenna nearby said tuner, said tuner comprising:

first electrically controlled front-end circuitry having an input port to which the radio-frequency signals received by said antenna are applied and having an output port for supplying a first intermediate-frequency signal with prescribed first carrier frequency as a frequency-conversion response to the one of the radio-frequency signals within said very-high-frequency and ultra-high-frequency bands that is selected for reception by said first electrically controlled front-end circuitry, that said one of the radio-frequency signals being selected for reception responsive to first remote control information;

a first amplifier having an input port to which the output port of said first electrically controlled front-end circuitry connects to supply said first intermediate-frequency signal thereto and having an output port for supplying amplified first intermediate-frequency signal to said first end of said transmission line;

a demodulator having an input port for receiving a carrier modulated by remote control information signal and having a first output port for supplying a reproduction of said remote control information signal recovered from demodulating said carrier modulated by said remote control information signal; and

electrical control circuitry connected for converting said reproduction of said remote control information signal to control signals for tunable radio-frequency amplifier and tunable local oscillator components of said first electrically controlled front-end circuitry, which said control signals impart said first remote control information to said first electrically controlled front-end circuitry.

5(previously presented). The tuner of claim 4, wherein said input port of said demodulator is connected for receiving via said transmission line said carrier modulated by said remote control information signal, and wherein said first amplifier is arranged for driving said transmission line without short-circuiting said transmission line for frequencies outside a frequency range occupied by said amplified first intermediate-frequency signal,

which said frequencies will appear in electrical signals to be received by said tuner via said transmission line and include each modulation frequency of said carrier modulated by said remote control information signal.

6(previously presented). A tuner for digital television signals, said tuner designed for driving a transmission line several meters long with intermediate-frequency signals responsive to selected ones of radio-frequency signals received by an antenna nearby said tuner, said tuner comprising:

first electrically controlled front-end circuitry having an input port to which the radio-frequency signals received by said antenna are applied and having an output port for supplying a first intermediate-frequency signal with prescribed first carrier frequency as a frequency-conversion response to the one of the radio-frequency signals selected for reception by said first electrically controlled front-end circuitry, said one of the radio-frequency signals being selected for reception responsive to first remote control information;

a demodulator having an input port for receiving a carrier modulated by remote control information signal and having a first output port for supplying first remote control information recovered from demodulating said carrier modulated by said remote control information signal;

a first amplifier having an input port to which the output port of said first electrically tunable front-end circuitry connects to supply first intermediate-frequency signal thereto and having an output port for supplying amplified first intermediate-frequency signal to said transmission line, said first amplifier being of a type presenting a source impedance at the output port thereof that is not larger than being comparable to the characteristic impedance of a prescribed type of transmission line, said first amplifier being arranged for driving said transmission line without short-circuiting said transmission line for frequencies outside a frequency range occupied by said amplified first intermediate-frequency signal, which said frequencies will appear in electrical signals to be received by said tuner via said transmission line and include each modulation frequency of said carrier modulated by said remote control information signal; and

a first bandpass coupler network for coupling the output port of said first amplifier to said transmission line over a range of frequencies occupied by said amplified first intermediate-frequency signal.

7(original). The tuner of claim 6, further comprising:

a first characteristic-impedance termination for said prescribed type of transmission line at the input port of said demodulator;

a second bandpass coupler network for coupling said transmission line to said first characteristic-impedance termination over a range of frequencies occupied by said carrier modulated by remote control information signal.

8(original). A combination in which the tuner of claim 6 is connected by said transmission line to apparatus for remotely controlling said first electrically controlled front-end circuitry, which apparatus comprises:

circuitry for generating said remote control information signal;

a modulator having an input port connected for receiving said remote control information signal as a modulating signal and having an output port for supplying said carrier modulated by remote control information signal; and

a third bandpass coupler network for coupling the output port of said modulator to said transmission line over the range of frequencies occupied by said carrier modulated by remote control information signal.

9(original). The combination of claim 8, wherein said apparatus for remotely controlling said first electrically controlled front-end circuitry is included within a digital television signal receiver further comprising:

a second characteristic-impedance termination for said prescribed type of transmission line;

a fourth bandpass coupler network for coupling said transmission line to said second characteristic-impedance termination over the range of frequencies occupied by said amplified first intermediate-frequency signal; and

circuitry for demodulating and digitizing said first intermediate-frequency signal, as coupled to said second characteristic-impedance termination, to generate a baseband digital television signal for further processing within said digital television signal receiver.

10(previously presented). The tuner of claim 6, wherein said demodulator is of a type having a second output port for supplying second remote control information recovered from demodulating said carrier modulated by remote control information signal, said tuner further comprising:

second electrically controlled front-end circuitry having an input port to which the radio-frequency signals received by said antenna are applied and having an output port for supplying a second intermediate-frequency signal with prescribed second carrier frequency responsive to the one of the radio-frequency signals selected for reception by said second electrically controlled front-end circuitry responsive to second remote control information recovered by said demodulator;

a second amplifier having an input port to which the output port of said second electrically tunable front-end circuitry connects to supply second intermediate-frequency signal thereto and having an output port to supply amplified second intermediate-frequency signal to said transmission line as terminated to provide a transmission line of apparently infinite length for said amplified second intermediate-frequency signal, the output port of said second amplifier having a source impedance that is not larger than being comparable to the characteristic impedance of a prescribed type of transmission line; and

a second bandpass coupler network for coupling the output port of said second amplifier to said transmission line over a range of frequencies occupied by said amplified second intermediate-frequency signal.

11(original). The tuner of claim 10, further comprising:

a first characteristic-impedance termination for said prescribed type of transmission line at the input port of said demodulator;

a third bandpass coupler network for coupling said transmission line to said characteristic-impedance termination over a range of frequencies occupied by said carrier modulated by remote control information signal.

12(original). A combination in which the tuner of claim 11 is connected by said transmission line to apparatus for remotely controlling both said first electrically controlled front-end circuitry and said second electrically controlled front-end circuitry, which apparatus comprises:

circuitry for generating said remote control information signal;

a modulator having an input port connected for receiving said remote control information signal as a modulating signal and having an output port for supplying said carrier modulated by remote control information signal; and

a fourth bandpass coupler network for coupling the output port of said modulator to said transmission line over the range of frequencies occupied by said carrier modulated by remote control information signal.

13(original). The combination of claim 12, wherein said apparatus for remotely controlling both said first electrically controlled front-end circuitry and said second electrically controlled front-end circuitry is included within a digital television signal receiver further comprising:

second and third characteristic-impedance terminations for said prescribed type of transmission line;

a fifth bandpass coupler network for coupling said transmission line to said second characteristic-impedance termination over the range of frequencies occupied by said amplified first intermediate-frequency signal;

circuitry for demodulating and digitizing said first intermediate-frequency signal, as coupled to said second characteristic-impedance termination, to generate a first baseband digital television signal;

a sixth bandpass coupler network for coupling said transmission line to said third characteristic-impedance termination over the range of frequencies occupied by said amplified second intermediate-frequency signal;

circuitry for demodulating and digitizing said second intermediate-frequency signal, as coupled to said third characteristic-impedance termination, to generate a second baseband digital television signal;

circuitry for further processing within said digital television signal receiver said first and second baseband digital television signals for recovering respective first and second sets of video signals; and

apparatus for generating a picture-in-picture video display responsive to said first and second sets of video signals.

14(previously presented). A tuner for digital television signals, said tuner designed for driving a transmission line several meters long with intermediate-frequency signals responsive to selected ones of radio-frequency signals received by an antenna nearby said tuner, said tuner comprising:

first electrically controlled front-end circuitry having an input port to which the radio-frequency signals received by said antenna are applied and having an output port for supplying a first intermediate-frequency signal with prescribed first carrier frequency as a frequency-conversion response to the one of the radio-frequency signals selected for reception by said first electrically controlled front-end circuitry, said one of the radio-frequency signals being selected for reception responsive to first remote control information;

a demodulator having an input port for receiving a carrier modulated by remote control information signal and having a first output port for supplying first remote control information recovered from demodulating said carrier modulated by said remote control information signal;

a first amplifier having an input port to which the output port of said first electrically tunable front-end circuitry connects to supply first intermediate-frequency signal thereto and having an output port for supplying amplified first intermediate-frequency signal to said transmission line, said first amplifier being a first transconductance amplifier, said first amplifier being arranged for driving said transmission line without short-circuiting said transmission line for frequencies outside a frequency range occupied by said amplified first intermediate-frequency signal, which frequencies will appear in electrical signals to be received by said tuner via said transmission line and include each modulation frequency of said carrier modulated by said remote control information signal;

a first characteristic-impedance termination for a prescribed type of transmission line, the output port said first transconductance amplifier coupling to said first characteristic-impedance termination; and

a first bandpass coupler network for coupling said first characteristic-impedance termination to the input port of said demodulator over a range of frequencies occupied by said carrier modulated by remote control information signal.

15(original). A combination in which the tuner of claim 14 is connected by said transmission line to apparatus for remotely controlling said first electrically controlled front-end circuitry, which apparatus comprises:

a second characteristic-impedance termination for said prescribed type of transmission line to which said transmission line couples for said amplified intermediate-frequency signal and for said carrier modulated by remote control information signal;

circuitry for generating said remote control information signal;

a modulator having an input port connected for receiving said remote control information signal as a modulating signal and having an output port for supplying said carrier modulated by remote control information signal; and

a further transconductance amplifier having an input port to which the output port of said modulator couples and having an output port coupled to said second characteristic-impedance termination.

16(original). The combination of claim 15, wherein said apparatus for remotely controlling said first electrically controlled front-end circuitry is included within a digital television signal receiver further comprising:

a second bandpass coupler network for selectively coupling said amplified first intermediate-frequency signal from said second characteristic-impedance termination; and

circuitry for demodulating and digitizing said amplified first intermediate-frequency signal, as selectively coupled thereto by said second bandpass coupler network, to generate a baseband digital television signal for further processing within said digital television signal receiver.

17(original). The tuner of claim 14, further comprising:

second electrically controlled front-end circuitry having an input port to which the radio-frequency signals received by said antenna are applied and having an output port for supplying a second intermediate-frequency signal with prescribed second carrier frequency responsive to the one of the radio-frequency signals selected for reception by said second electrically controlled front-end circuitry responsive to second remote control information recovered by said demodulator; and

a second transconductance amplifier having an input port to which the output port of said second electrically tunable front-end circuitry connects to supply second intermediate-frequency signal thereto and having an output port for supplying amplified second intermediate-frequency signal connected to said first characteristic-impedance termination.

18(original). A combination in which the tuner of claim 17 is connected by said transmission line to apparatus for remotely controlling both said first electrically controlled front-end circuitry and said second electrically controlled front-end circuitry, which apparatus comprises:

a second characteristic-impedance termination for said prescribed type of transmission line to which said transmission line couples for said amplified first intermediate-frequency signal, for said amplified second intermediate-frequency signal and for said carrier modulated by remote control information signal;

circuitry for generating said remote control information signal;

a modulator having an input port connected for receiving said remote control information signal as a modulating signal and having an output port for supplying said carrier modulated by remote control information signal; and

a further transconductance amplifier having an input port to which the output port of said modulator couples and having an output port coupled to said second characteristic-impedance termination.

19(original). The combination of claim 18, wherein said apparatus for remotely controlling both said first electrically controlled front-end circuitry and said second electrically controlled front-end circuitry is included within a digital television signal receiver further comprising:

circuitry for demodulating and digitizing said amplified first intermediate-frequency signal, as selectively coupled thereto from said second characteristic-impedance termination, to generate a first baseband digital television signal;

circuitry for demodulating and digitizing said amplified second intermediate-frequency signal, as selectively coupled thereto from said second characteristic-impedance termination, to generate a second baseband digital television signal;

circuitry for further processing within said digital television signal receiver said first and second baseband digital television signals for recovering respective first and second sets of video signals; and

apparatus for generating a picture-in-picture video display responsive to said first and second sets of video signals.

20(previously presented). A combination in which the tuner of claim 5 is connected by said transmission line to a digital television signal receiver that comprises:

demodulation and analog-to-digital conversion circuitry connected for responding to said first intermediate-frequency signal to generate a baseband digital television signal;

circuitry for generating said remote-control information signal, said remote control information signal descriptive of at least said first remote control information; and

a modulator for generating said carrier modulated by said remote control information signal and coupling said carrier modulated by said remote control information signal to said transmission line.

21(previously presented). A combination in which the tuner of claim 5 is connected by said transmission line to an apparatus comprising:

circuitry for generating said remote-control information signal, said remote control information signal descriptive of at least said first remote control information;

a modulator for generating said carrier modulated by said remote control information signal and coupling said carrier modulated by said remote control information signal to said transmission line; and

electrically controlled frequency-conversion apparatus for converting said first intermediate-frequency signal to a radio-frequency signal in a frequency range that can be detected by a broadcast digital television receiver.

22(previously presented). The tuner of claim 1, wherein said cable-driver amplifier is of a type presenting a source impedance at the output port thereof that is not larger than being comparable to the characteristic impedance of a prescribed type of transmission line, said tuner further comprising:

a first bandpass coupler network for coupling the output port of said cable-driver amplifier to said transmission line over a range of frequencies occupied by said amplified first intermediate-frequency signal.

23(previously presented). A tuner for digital television signals within very-high-frequency or ultra-high-frequency bands prescribed for terrestrial television broadcast transmitters, said tuner designed for driving a transmission line several meters long with intermediate-frequency signals responsive to selected ones of radio-frequency signals transmitted over the air from terrestrial television broadcast transmitters and received by an antenna nearby said tuner, said tuner comprising:

first electrically controlled front-end circuitry having an input port to which the radio-frequency signals received by said antenna are applied and having an output port for supplying a first intermediate-frequency signal with prescribed first carrier frequency as a frequency-conversion response to the one of the radio-frequency signals within said very-high-frequency or ultra-high-frequency bands that is selected for reception by said first electrically controlled front-end circuitry, that said one of the radio-frequency signals being selected for reception responsive to first remote control information; and

a first amplifier having an input port to which the output port of said first electrically controlled front-end circuitry connects to supply said first intermediate-frequency signal thereto and having an output port for supplying amplified first intermediate-frequency signal to said transmission line — said first electrically controlled front-end circuitry in said tuner comprising:

electrically tuned radio-frequency amplifier circuitry connected to be tuned responsive to said first remote control information to selectively amplify one of said radio-frequency signals supplied via the input port of said first electrically controlled front-end circuitry, said radio-frequency amplifier circuitry connected for supplying a response to the selectively amplified one of said radio-frequency signals, said radio-frequency amplifier circuitry connected for having the gain of its said response controlled by an automatic gain control signal applied thereto;

an electrically tuned local oscillator connected to be tuned responsive to said first remote control information for supplying local oscillations of a frequency determined by said first remote control information;

frequency conversion circuitry connected for receiving as a first input signal thereof said local oscillations, connected for receiving as a second input signal thereof said radio-frequency amplifier circuitry response to the selectively amplified one of said radio-frequency signals, and connected for supplying a modulated carrier wave at said prescribed first carrier frequency;

intermediate-frequency amplifier circuitry having an input port connected to receive said modulated carrier wave at said prescribed first carrier frequency supplied from said frequency conversion circuitry and having an output port connected to supply said first intermediate-frequency signal to said input port of said first amplifier;

an envelope detector connected for developing an envelope detector response to said first intermediate-frequency signal; and

automatic gain control signal generation circuitry connected for responding to said envelope detector response to generate said automatic gain control signal applied to said radio-frequency amplifier circuitry.

24(previously presented). The tuner of claim 23, further comprising:

a demodulator having an input port for receiving a carrier modulated by remote control information signal and having a first output port for supplying demodulated remote control information signal recovered from demodulating said carrier modulated by remote control information signal; and

electrical control circuitry connected for converting said demodulated remote control information signal to control signals for said electrically tuned radio-frequency amplifier circuitry and said electrically tuned local oscillator, which said control signals impart said first remote control information to said first electrically controlled front-end circuitry.

25(previously presented). The tuner of claim 24, wherein said first amplifier is arranged for driving said transmission line without short-circuiting said transmission line for frequencies in electrical signals to be received by said tuner via said transmission line, said tuner further comprising:

a second bandpass coupler network for coupling said input port of said demodulator to receive from said transmission line said carrier modulated by said remote control information signal.

26(previously presented). The tuner of claim 5 in combination with remote control apparatus for generating said carrier modulated by remote control information signal, said remote control apparatus comprising:

circuitry for generating said remote-control information signal to be used as modulating signal for said carrier modulated by remote control information signal; and

a modulator having an input port connected for receiving said modulating signal and having an output port for supplying said modulated signal, the modulation of which said modulated signal is determined responsive to said remote control information signal and at times is composed of several simultaneously occurring frequencies; and

a coupling network for coupling said modulated signal to the second end of said transmission line, said coupling network designed to avoid causing significant echoes in the response at the second end of said transmission line to a television signal applied to the first end of said transmission line at said site of said reception antenna.

27(previously presented). The combination of claim 26, wherein said modulator is of a type providing a multiple-tone type of modulation, so said modulated signal sometimes comprises several tones coupled simultaneously to said proximal end of said transmission line.

28(previously presented). The combination of claim 26, wherein said remote control information signal comprises channel identifier signal concerning channel selection of said television signal to be applied to the first end of said transmission line.

29(previously presented). The combination of claim 28, wherein said remote control apparatus is included in a local digital television receiver adapted for receiving said amplified first intermediate-frequency signal from the second end of said transmission line; said local demodulator apparatus further comprising:

amplifier circuitry with automatic gain control connected for supplying a controlled-gain response to said amplified first intermediate-frequency signal as delivered at the second end of said transmission line;

demodulation and analog-to-digital conversion circuitry connected for responding to said controlled-gain response to said amplified first intermediate-frequency signal to generate a baseband digital television signal;

channel equalization and echo suppression filtering connected for equalizing the channel for said baseband digital television signal and suppressing echoes therein;

a trellis decoder connected for symbol decoding said baseband digital television signal after channel equalization and echo suppression to reproduce a convolutionally interleaved data stream;

a deinterleaver connected for de-interleaving said convolutionally interleaved data stream to recover a succession of Reed-Solomon coded packets of randomized data;

a Reed-Solomon error corrector connected for correcting, insofar as possible, said succession of Reed-Solomon coded packets of randomized data to generate correct packets of randomized data;

a data de-randomizer connected for de-randomizing said correct packets of randomized data to generate packets of de-randomized data supplied as a transport stream.

30(previously presented). The combination of claim 29, wherein said local digital television receiver is of a special type that omits local tuner circuitry for selecting television signals from the very-high-frequency or ultra-high-frequency bands prescribed for terrestrial television broadcast transmitters.

31(previously presented). The combination of claim 29, wherein said local digital television receiver is of cable-ready type having local tuner circuitry for selecting television signals from superband channels prescribed for cable television transmitters, and wherein said first intermediate-frequency signal is disposed within one of said superband channels.

32(previously presented). The combination of claim 28, wherein said remote control apparatus is included in a local converter apparatus adapted for receiving said amplified first intermediate frequency signal as delivered at the second end of said transmission line, said local converter apparatus further comprising:

a frequency converter for converting said first amplified intermediate-frequency signal as delivered at the second end of said transmission line to a radio-frequency television broadcast signal receivable by a television receiver for terrestrial broadcast television signals.